QUALITY ASSURANCE/ QUALITY CONTROL PLAN

SECTION 106
AMBIENT WATER QUALITY MONITORING
(CORE/TREND MONITORING)

MARYLAND DEPARTMENT OF NATURAL RESOURCES
RESOURCE ASSESSMENT SERVICE
MONITORING AND NON-TIDAL ASSESSMENT DIVISION

JULY 2004

QUALITY ASSURANCE/QUALITY CONTROL PLAN

Section 106 Ambient Water Quality Monitoring
(CORE/TREND MONITORING)

Maryland Department of Natural Resources

Resource Assessment Service

Monitoring and Non-Tidal Assessment Division

July 2004

1. Project Name: 106 Ambient Water Quality Monitoring

2. Project Requested By: U.S. Environmental Protection Agency

3. Date of Request: 1972

4. Date of Project Initiation: 1974, Revised 1978

5. Project Coordinator: Sara Bowen (Maryland Department of Natural Resources)

6. Quality Assurance Officer: Greg Gruber (Maryland Department of Natural Resources)

7. Project Description:

   A. Project Goal

   The ambient fixed station water quality monitoring program is used primarily to determine trends in water use areas, problem areas, land use areas and in areas where future development may impact water quality. This monitoring program used by Maryland is also part of its assessment of state-wide water quality trends. Sampling locations (62) are distributed throughout the state with particular attention to the Potomac River.

   B. Data Usage

   Water quality data collected by this fixed station network are incorporated into the 305 (b) reporting process. The 305 (b) report for Maryland is combined with those from other states to assess national water quality conditions and trends. These data may also support state needs such as water quality modeling efforts and the evaluation of pollution abatement programs.

   C. Monitoring Network Design and Rationale

   CORE Stations

   Station selection was based upon EPA's Basic Water Monitoring Program (BWMP) manual. The selection of stations for the CORE network was guided primarily by the need to assess conditions in water use areas. These included recreational areas, surface water supply areas, land use areas and potential areas of development. Since these data will be used in the national assessment program, both impacted and non-impacted areas were included in the network to ensure that the evaluation would not be biased.

Sampling stations were also selected to be representative of various regions in Maryland. Where consistent with the aforementioned criteria, stations were located to maintain continuity with existing sites.

Water quality data are collected monthly from each of 37 CORE stations located throughout the State (Figure 1) as part of the US Environmental Protection Agency's national monitoring network. Samples are collected from the surface at each station and analyzed for a variety of physical and chemical parameters. At estuarine CORE stations, samples are also collected at various depths. A number of sampling stations in the western part of the State also are sampled for acidity, sulfate and iron to monitor the impact of acid mine-drainage. Some CORE stations are now sampled as part of the State's Chesapeake Bay Mainstem or Tributary Monitoring network.

TREND Stations

In addition to the CORE network, water quality samples also are routinely collected at a number of stations that represent an earlier Statewide "TREND" monitoring network. Samples from these 25 stations are collected when CORE stations are sampled and as time and scheduling permit. The samples are analyzed along with CORE samples and the results follow the same, rigid quality assurance and control as do the CORE program results. Data collected from these stations provide an additional layer of data for use by managers.

A map of station locations is attached (Figure 1) as well as a description of station locations (Table 1). Water quality parameters and collection frequencies are shown in Table 2.

8. Schedule of Tasks and Projects

The ambient fixed station water quality monitoring program was initiated in its present form. Since this is an ongoing effort, Table 4 represents the schedule and time required to complete each of the tasks associated with monthly collections. Status and trends are calculated annually and provided on the internet as well as provided directly to Tributary Strategy workgroups. Once every two years, the data are used in preparation of the required 305 (b) report and are available to the public on the Chesapeake Bay program server.

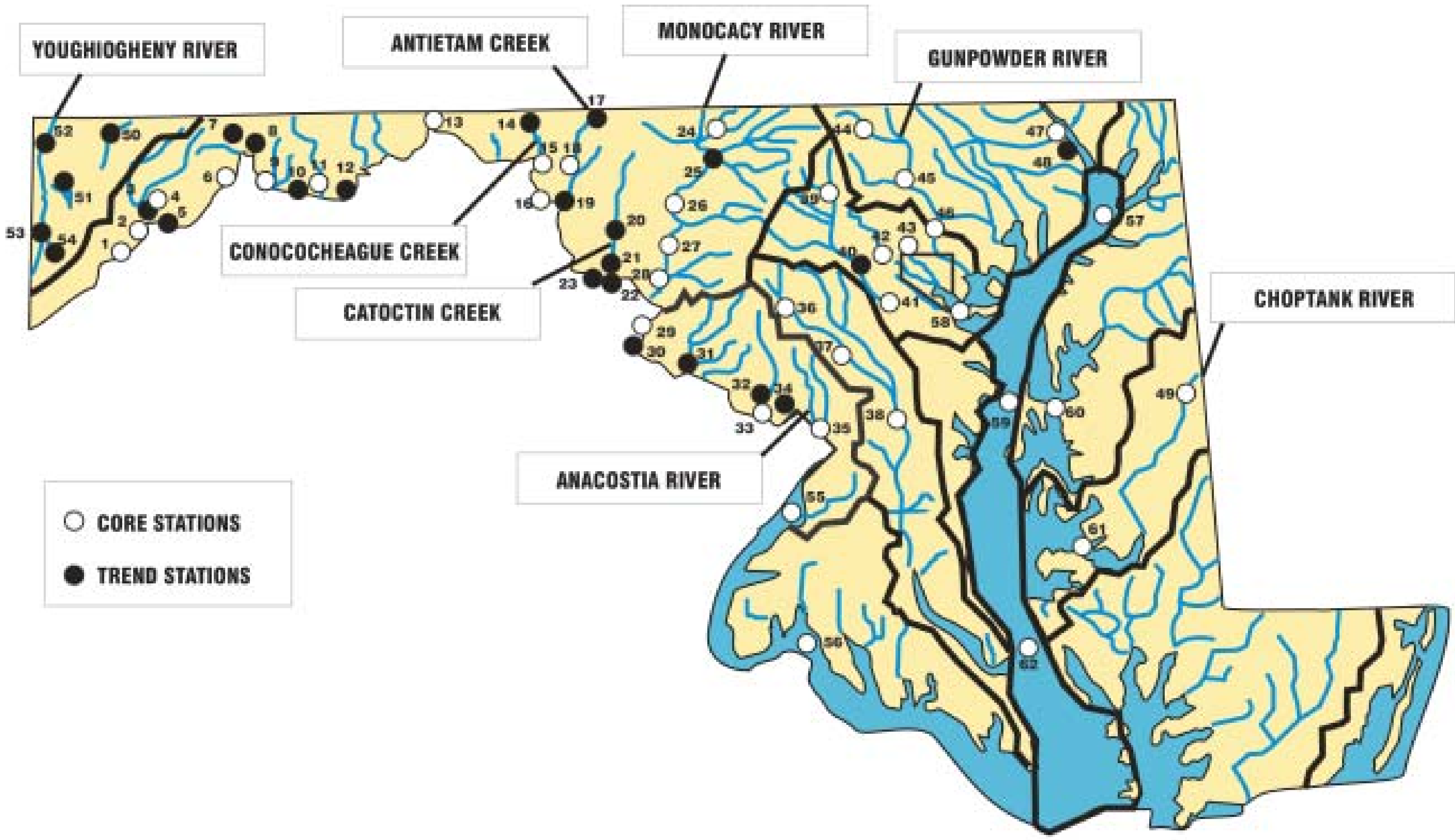

Figure 1. Maryland CORE/TREND Ambient Water Quality Monitoring Stations

Table 1. STATE OF MARYLAND DEPARTMENT OF NATURAL RESOURCE'S AMBIENT WATER QUALITY MONITORING SAMPLING LOCATIONS

NAD 83						
Map #	**Station I.D.**	**Stream Name**	**River Mile**	**Longitude**	**Latitude**	**Description**
02-12-02 SUSQUEHANNA RIVER BASIN						
47	C - SUS 0109 (CB 1.0)	Susquehanna River	10.90	076 10.5023788	39 39.3729986	At Conowingo Dam gaging stationUSGS-01578310
48	TR - DER 0015	Deer Creek	1.50	076 09.8863318	39 37.4085651	Bridge on Stafford Bridge Road
02-13-04 CHOPTANK RIVER BASIN						
61	C - XEH 4766 (ET 5.2)*	Choptank River		076 03.5202530	38 34.8394323	At drawspan on U.S. Rt. 50 bridge
49	C - CHO 0626 (ET 5.0)	Choptank River	62.60	075 47.1864631	38 59.8311087	At Red Bridges near Sewell Mills USGS-01491000
02-13-05 CHESTER RIVER BASIN						
60	C - XGG 8251	Kent Island Narrows		076 14.8401240	38 58.2675736	At drawspan on Route 50 bridge
02-13-08 GUNPOWDER RIVER BASIN						
46	C - GUN 0125	Gunpowder Falls	12.50	076 31.7336277	39 25.5375149	At bridge on Cromwell Bridge Road
45	C - GUN 0258	Gunpowder Falls	25.80	076 38.1520258	39 33.0386351	End of Glencoe Road at old bridge crossing
44	C - GUN 0476	Gunpowder Falls	47.60	076 46.8285205	39 41.3615564	Bridge at Gunpowder Road
02-13-09 PATAPSCO RIVER BASIN						
42	C – GWN 0115	Gwynns Falls	11.50	076 43.5833003	39 20.5671785	At bridge on Essex Road in Villa Nova near gaging station USGS-01589300
41	C – PAT 0176	Patapsco River	17.60	076 42.3202382	39 13.0687759	At bridge on Washington Boulevard (U.S. Rt. 1)
40	TR – PAT 0285	Patapsco River	28.50	076 47.5345192	39 18.7467204	At bridge on Md. Rt. 99 near Hollofield gage USGS-01589000
39	C – NPA 0165	N. Branch Patapsco	16.50	076 52.9250807	39 28.9671330	Bridge at Md. Route 91 near gage USGS-01586000
43	C – JON 0184	Jones Falls	10.8	076 39.68155	39 23.0730508	Near bridge on Falls Road (Md. Rt. 25) at Sorrento USGS-01589440

NAD 83						
Map #	**Station I.D.**	**Stream Name**	**River Mile**	**Longitude**	**Latitude**	**Description**
02-13-09 PATAPSCO RIVER BASIN (cont.)						
58	C – XIE 2885 (WT 5.1)*	Patapsco River	5.31	076 31.3521434	39 12.7856735	At buoy 5M, Hawkins Point
02-13-11 PATUXENT RIVER BASIN						
38	C – PXT 0603 (TF 1.0)	Patuxent River	61.58	076 41.6465749	38 57.3343692	At bridge on U.S. Route 50
37	C – PXT 0809	Patuxent River	81.91	076 52.4958913	39 07.0081428	At the gaging station just below Rocky Gorge Dam USGS-01592500
36	C – PXT 0972	Patuxent River	102.22	077 03.3713472	39 14.3584868	At bridge on Md. Route 97 near Unity gage USGS-01591000
02-13-99 CHESAPEAKE BAY MAINSTEM						
57	C – XJH 6680 (CB 2.1)*	Chesapeake Bay		076 01.5594740	39 26.4894865	200 yds. northeast of buoy RBA, mid-bay, south of Turkey Point, 15' depth
59	C – XHF 1373 (CB 3.3C)*	Chesapeake Bay		076 22.1808	39. 00.84772	2100 yds., NE of Sandy Point, 55' depth
62	C – XCG 8613 (CB 5.1)*	Chesapeake Bay	94.00	076 18.6833820	38 18.6510555	At the RP PR bell buoy off Cedar Point, total depth 55' (17m.)
02-14-01 LOWER POTOMAC RIVER BASIN						
56	C – XDC 1706 (RET 2.4)*	Potomac River		076 59.4376865	38 21.7559638	In mid-channel at Morgantown Bridge (U.S. Route 301), 58' depth
55	C – XEA 6596 (TF 2.3)*	Potomac River		077 10.4383095	38 31.8040859	Buoy N54 off Indian Head, 44' depth
02-14-02 WASHINGTON METROPOLITAN AREA						
33	C – POT 1184	Potomac River	118.40	077 07.6400929	38 56.8928182	At gaging station just above Little Falls Dam USGS-1646500
29	C – POT 1471	Potomac River	147.10	077 31.2750641	39 09.2651668	At Eastern Terminus off Whites Ferry
30	TR – POT 1472	Potomac River	147.0	077 31.3390209	39 09.3307768	At Western Terminus of Whites Ferry
35	C – ANA 0082	Anacostia River	8.20	076 56.6068030	38 56.3360716	At bridge on Bladensburg Road

NAD 83						
Map #	**Station I.D.**	**Stream Name**	**River Mile**	**Longitude**	**Latitude**	**Description**
02-14-02 WASHINGTON METROPOLITAN AREA (cont.)						
34	TR – RCM 111	Rock Creek	11.10	077 03.7817405	38 59.5812919	At bridge on Md. Route 410
32	TR – CJB 0005	Cabin John Creek	0.50	077 08.9301668	38 58.4069338	At bridge on MacArthur Boulevard
31	TR – SEN 0008	Seneca Creek	0.80	077 20.3781583	39 04.7749739	At bridge on Md. Route 112
02-14-05 UPPER POTOMAC BASIN						
22	TR – POT 1595	Potomac River	159.50	077 32.6203211	39 16.4085768	At bridge on U.S. Rt. 15 near Pt. of Rocks USGS-1638500
23	TR – POT 1596	Potomac River	159.55	077 32.8740048	39 163250283	Bridge on Md. Route 28
28	C – MON 0020	Monocacy River	2.00	077 26.4946321	39 16.3025469	Bridge on MD 28
27	C – MON 0155	Monocacy River	15.50	077 22.8656221	39 23.2669471	Bridge on Reels Mill Rd.
26	C – MON 0269	Monocacy River	26.90	077 23.3631412	39 28.8165566	Bridge on Biggs Ford Rd.
24	C – MON 0528	Monocacy River	52.80	077 14.0929806	39 40.7500155	Bridgeport Bridge on Md. Rt. 97 USGS-01639000
25	TR – BPC 0035	Big Pipe Creek	3.50	077 14.2924934	39 36.7306812	Bridge on Md. Rt. 194 USGS gaging station
21	TR – CAC 0031	Catoctin Creek	3.10	077 34.8107379	39 19.9069327	Near mouth at bridge on Md. Route 464
20	TR – CAC 0148	Catoctin Creek	14.80	077 33.5401108	39 25.5468858	At bridge on Md. Route 17 at gaging station USGS-01637500
16	C – POT 1830	Potomac River	183.00	077 48.1594887	39 26.1046394	At gaging station below bridge on Md. Rt. 34 USGS-01618000
13	C – POT 2386	Potomac River	238.60	078 10.5781510	39 41.4671425	At gaging station 0.5 mile below bridge on U.S. Rt. 522 USGS-0161300
19	TR – ANT 0044	Antietam Creek	4.40	077 43.8991688	39 27.0219634	At gaging station just below Burnside Bridge near Sharpsburg USGS-01619500
18	C – ANT 0203	Antietam Creek	20.30	077 42.6475848	39 35.6775584	At bridge on Poffenberger Rd. near Funkstown
17	TR – ANT 0366	Antietam Creek	20.30	077 36.4935486	39 42.9592863	At gaging station west of MD 60 at Rocky Forge

NAD 83						
Map #	**Station I.D.**	**Stream Name**	**River Mile**	**Longitude**	**Latitude**	**Description**
02-14-03 UPPER POTOMAC RIVER BASIN (cont')						
15	C – CON 0005	Conococheague Creek	0.50	077 49.2963323	39 36.1943845	Md. 68 bridge
14	TR –CON 0180	Conococheague Creek	18.00	077 49.5032338	39 42.9627173	At gaging station 0.7 miles above bridge on Fairview Rd. USGS-01614500
12	TR – POT 2766	Potomac River	276.60	078 27.2695565	39 32.3189316	At bridge on Md. Rt. 51 near Paw Paw, W. Va. USGS-01610000
11	C – TOW 0030	Town Creek	3.00	078 33.2032866	39 33.1821660	At gage near bridge on Oldtown Road USGS-01609000
02-14-10 NORTH BRANCH POTOMAC RIVER BASIN						
10	TR – NBP 0023	N. Branch Potomac	2.30	079 39.3300605	37 58.4618290	Toll bridge at Oldtown
9	C – NBP 0103	N. Branch Potomac	10.30	078 43.8873501	39 34.9607011	Just west of intersection of Moores Hollow Rd. and Md. Route 51
6	C – NBP 0326	N. Branch Potomac	32.60	078 50.3348823	39 34.0064182	USGS gaging station near W. Md. RR bridge at Pinto USGS-01600000
5	TR – NBP 0461	N. Branch Potomac	46.10	078 58.3048527	39 26.6943955	At bridge on U.S. Route 220
7	TR – BDK 0000	Braddock Run	0.01	078 47.4487205	39 40.2286587	Braddock Run just above its mouth near junction U.S. 40 and Md. 36
8	TR – WIL 0013	Wills Creek	1.38	078 46.8174564	39 39.7110428	Gaging station downstream from confluence with Braddock Run USGS-01601500
4	C – GEO 0009	Georges Creek	0.90	079 02.6819423	39 29.6183080	On right bank at Franklin 1 mile north of Westernport USGS – 1-5990
2	C – NBP 0534	N. Branch Potomac	53.48	079 04.0814362	39 28.7536221	North Branch at Bloomington just upstream of confluence with Savage River
1	C – NBP 0689	N. Branch Potomac	68.90	079 10.7614696	39 23.3607386	.6 mile downstream of Md. 38 bridge over North Branch USGS – 1-5955

NAD 83						
Map #	**Station I.D.**	**Stream Name**	**River Mile**	**Longitude**	**Latitude**	**Description**
02-14-10 NORTH BRANCH POTOMAC RIVER BASIN (cont.)						
3	TR – SAV 0000	Savage River	0.02	079 04.0838436	39 28.8359583	Savage River at Md. 135
05-02-02 YOUGHIOGHENY RIVER BASIN						
52	TR – YOU 0925	Youghiogheny River	94.00	079 24.5074447	39 39.1739972	Gage 0.7 mile upstream from bridge on Md. Rt. 42 at Friendsville USGS – 3-0765
53	TR – YOU 1139	Youghiogheny River	115.91	079 25.3143438	39 25.4158776	Just north of Rt. 20 bridge downstream from Little Youghiogheny USGS – 2-0755
54	TR – LYO 0004	Little Youghiogheny	0.38	079 25.1550365	39 25.1060846	Site of old foot bridge 0.4 mile above mouth
51	TR – CCR 0001	Cherry Creek	0.15	079 18.9509986	39 32.2335135	Cherry Creek at Meadow Mt. Run Road Bridge
50	TR – CAS 0479	Casselman River	47.92	079 08.1846184	39 42.1242778	Casselman River where crossed by River Road at USGS station 3-0780

* = Bay Program Sampling Protocol Applies
C = Core Station
TR = Trend Station
(   ) = New Station Name

Table 2 – Water quality parameters and their analysis

Parameter	Method/Reference	Sample Preservation	Holding Time	Detection Limits
*Temperature	N.B.S. calibrated EPA 1979 #170		< 5 min.	0.1°C
* Flow	USGS records			
*D.O.	Membrane Probe EPA 1979 #360		< 5 min.	0.2 µg/L
*pH	Glass Probe EPA 1979 #50		< 5 min.	0.5 units
*Specific Conductance	Conductivity Bridge APHA #205		< 5 min.	5 µmhos/cm
*Secchi Disc	8-inch Black/White		< 5 min.	0.1 meter
TOC	IR SM 5310 B	Iced	24 hrs.	1.0 mg/L
NH_4	Apkhem Analyzer EPA 1979 #351	Iced	24 hrs.	0.008 mg/L
TKN	Colorimetric EPA 1979 #351	Iced	24 hrs.	0.1 mg/L
$NO_2 + NO_3$	Apkhem Analyzer EPA 1979 #353.2	Iced	24 hrs.	0.002 mg/L
NO_2	Apkhem Analyzer EPA 1979 #353.2	Iced	24 hrs.	0.002 mg/L
PO_4	Apkhem Analyzer EPA 1979 #365.1	Iced	24 hrs.	0.004 µg/L
TP	Technicon Analyzer EPA 1979 #365.4	Iced	24 hrs.	0.01 mg/L
Suspended Solids	Standard Method 2540D	Iced	24 hrs.	1.0 mg/L
Turbidity	Light Scatter (NTU) EPA 1979 #180	Iced	24 hrs.	0.01 NTU
Chlorophyll "a"	Spectrophotometric SM 20th Ed.	Filtered, Frozen	4 weeks	0.01 µg/L
Phaeophytin "a"	APHA 17th. ws. #10200H.2			
Alkalinity, Total	Titration APHA #403	Iced	24 hrs.	0.1 mg/L$CaCO_3$

[1]Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Washington, D.C. (EPA-600/4-79-020). 1979.

[2]Standard Methods for the Examination of Water and Wastewater. American Public Health Association, Washington, D.C. 20th Edition.

*In situ measurement. All others are grab samples.

1982 Began routinely using Hydrolab field instruments
1980 Switched from Department of Natural Resources Laboratory to Department of Health and Mental Hygiene est. 1981 Upgrade Spectrophotometer for chlorophyll/phaeophytin
1983 XCG8613 Began field filtering for dissolved nutrients, April 1992 went to dissolved & particulate nutrients
Oct. 1990 Began field filtering for dissolved nutrients at XDC1706 and XEA6596
1991 Began field filtering XHF1373, XJH6680 for dissolved and particulate fractions, no whole water fractions
1993 Late fall began using Apkhem instrumentation for nutrients. Technicon Analyzer used 1974-1993.
1994 Began analyzing TOC with new instrumentation

Monthly sampling and data processing schedule.

Task	Time Required	Cumulative Time
Sample Collection	20 person days	2 weeks
Laboratory Analysis	1 week	2 weeks
Data Verification	1 week	3 weeks
Data Keypunching	1 week	4 weeks
Final Data Verification	2 weeks	6 weeks

9. Project Organization and Responsibility

The following is a list of key program personnel and their corresponding responsibilities.

Person/Responsibility	Phone Number
Sara Bowen – sampling operations and project coordination	410-990-4528
Greg Gruber – sampling QC	410-990-4519
Prince Kassim, Ph.D. – laboratory analysis	410-767-6192
Asoka Katumuluwa, Ph.D. – laboratory QC	410-767-6192
Bruce Michael – data processing activities	410-260-8627
Paul Miller – data analysis	410-260-8616

10. Data Quality Requirements and Assessments (see Table 2)

A. Data Collection

Data collected at each river sampling station provides specific information concerning water quality in that immediate vicinity and furthermore allows one to assess the cumulative effect of upstream influences. Several rivers within the state (Patuxent, Potomac, Monocacy, Patapsco, Gunpowder Falls, and Choptank) contain two or more stations. For these rivers, more detailed information can be deduced regarding the relationship between different reaches and the effect of intervening influences.

One station was placed in each of the three segments of the Chesapeake (upper, middle, lower) within Maryland waters to characterize this important estuary.

At each station, a surface grab sample is collected, if possible, at mid-channel. For the boat stations on the Chesapeake Bay, additional samples are collected from middle depths. This sampling strategy provides enough data to categorize both the relatively well-mixed shallow rivers and salinity-stratified estuarine areas.

B. Data Comparability

Identical parameters are measured at most monitoring stations, thereby allowing data to be compared at a particular station both within and between years. Furthermore, data can be compared between stations over temporal scales. Inclusion of some stations within new sampling programs has modified the parameters measured at these stations. Before doing long-term trend analysis, these modifications need to be addressed. In addition, upgrades to laboratory methods and/or equipment may affect long term data comparisons.

C. Data Completeness

Parameters measured in the water column include all major nutrients. (N and P) and their constituents, total organic carbon, suspended solids and chlorophyll “a”. Nutrients, suspended solids, and total organic carbon are helpful when used to assess the impacts of waste water. Nutrients are also critical to phytoplankton development. Comparing nutrient levels and chlorophyll concentrations allows an assessment of algal growth.

D. Data Availability

To obtain data from Maryland’s ambient water quality monitoring network, point your Internet browser to www.chesapeakebay.net. Summary statistics (status and trends) for total nitrogen, total phosphorus and total suspended solids are available on the Internet http://www.dnr.state.md.us/streams/status_trend/index.html Flow data may be obtained from http://waterdata.usgs.gov/MD/nwis/

11. Sample Collection Procedures

Grab samples are taken by bucket just below the water surface at stations where only one depth is sampled. A single depth integrated sample is taken (depth permitting), using a DH-95, at BEL 0043, CON 0108, MON 0528, GEO 0009, TUK 0133 and POT 1595 beginning in October, 2004. At boat stations where depth samples are collected, a submersible pump is used. Unless otherwise stated, all water samples requiring chemical analysis are stored at 4°C. Samples for chlorophyll determinations are filtered through a Whatman Type GF/F glass fiber filter since 1984. The 1974-1983 monitoring efforts used Gelman Type

A/E filters. Samples are filtered immediately upon collection and stored on ice in a dark bottle (for times not to exceed 8 hours) and then frozen. Conductivity, pH, temperature and dissolved oxygen are measured directly in the field with instruments manufactured by Hydrolab (except in 1974-1982, when YSI meters were used). Flow rates are obtained from USGS gaging records. Additional details concerning sampling procedures can be found in Tables 1 and 2. At selected boat stations, samples are separated at the time of collection into dissolved and particulate fractions. No whole water sample is analyzed, but only the dissolved and particulate fractions.

12. Sample Handling Procedures

Samples are collected and transported by Department of Natural Resources (DNR) Monitoring Program field personnel. Samples may be delivered directly to the State Lab by the field personnel or left with a courier for delivery to the State Lab. Data sheets accompany these samples to the laboratory. Data produced from laboratory analysis and field measurements then follow a controlled pathway to computer files under the direction of a data processing manager. Stringent chain-of-custody controls and documentation do not apply to this program since these data are not used for enforcement purposes.

13. Calibration Procedures and Preventive Maintenance

All Hydrolab instruments are calibrated both prior to and after their use for measuring temperature, pH, dissolved oxygen and conductivity. All calibration checks are recorded in field log books. Laboratory personnel follow EPA guidelines on quality control and quality assurance.

14. Documentation, Data Reduction and Reporting

A. Documentation

Record-keeping begins at the time that samples are collected. Field measurements are recorded on field data sheets. A chemistry data sheet is initiated at the time of collection for each set of samples that are submitted to the state lab for analysis. These sheets accompany the samples to the lab and are signed in when received. Following analysis, data are entered onto chemistry data sheets and routed to data processing. Data sheets are then sent to keypunchers who double enter the data onto Maryland's Water Quality computer data base. Originals of chemistry sheets are kept by the laboratories. Field sheets are retained and filed by DNR's field office.

B. Data Reduction and Reporting

Numerous checks have been instituted to assure that errors in the final data set are virtually eliminated. Both field and chemistry data sheet entries are double-checked by those persons making the quantitative determinations. All data sheets are then double-entered by keypunchers to reduce errors occurring at this stage.

To reduce analytical errors, parameters obtained by calculation from measured parameters are calculated by the computer.

15. Data Validation

In addition to the procedures instituted to reduce “paper work” errors as described above, data are evaluated to validate its accuracy. After the data have been placed on computer files, each of the parameters is checked by an outlier program to flag obvious errors. In addition, investigators familiar with each collection site review all data sets to ensure that the records are consistent with their expectations based upon site-specific characteristics, time of year, hydrographic conditions.

16. Performance and Systems Audits

It is the responsibility of the Project Coordinator to conduct on-site investigations of field and laboratory work including an evaluation of sampling, calibration, measurement and quality control protocols.

17. Corrective Action

If a consistent pattern develops for the “outlier” data or if the percent recovery of any constituent in the quality control samples consistently differs from the expected value by more than +10%, then it is the responsibility of the Quality Assurance Officer to implement a corrective action plan. This plan is a methodical scheme for identifying the source of the problem, its cause and its correction. The results of each step in the implementation of the plan is documented in a “flow chart” format. It is also the responsibility of the Quality Assurance Officer to tabulate all the outlier and quality assurance/quality control (QA/QC) data, to show diagrammatically the results of each stage of any corrective action taken, and to forward this information to the overall Project Coordinator.

18. <u>Reports</u>

The primary reporting mechanism for the CORE component of the 106 monitoring program is the 305 (b) report. This report provides a comprehensive assessment of Maryland's waters incorporating the 106 monitoring program results in addition to other intensive or routine water quality surveys.

19. <u>Cost</u>

Field Program = 1.2 FTE